CLAIMS

What is claimed is:

1. An automated method for patterning a plurality of electronic elements on a substrate comprising:

measuring an existing geometric pattern on an $n^{th}$ layer of said substrate;

calculating a correction between said existing geometric pattern and an expected pattern for said $n^{th}$ layer;

performing an image transformation on a pattern for an $(n+1)^{th}$ layer of said substrate, based on said correction, to generate a corrected pattern; and

writing said corrected pattern onto said $(n+1)^{th}$ layer of said substrate using a programmable digital mask system.

2. The method as described in Claim 1 wherein said writing is performed by a writing component that comprises a radiation source.

3. The method as described in Claim 2 wherein said writing comprises guiding radiation from said radiation source to said programmable digital mask system and from said programmable digital mask system to said substrate using an optical system.

4. The method as described in Claim 2 wherein said radiation source comprises a pulsed laser source utilizing inter-pulse intervals.

5. The method as described in Claim 2 wherein said radiation source is infrared light.

6. The method as described in Claim 2 wherein said radiation source is ultraviolet light.

7. The method as described in Claim 2 wherein said radiation source is x-ray.

8. The method as described in Claim 1 wherein said measuring optical measuring performed by an optical measurement device.

9. The method as described in Claim 1 wherein said existing geometric pattern comprises a plurality of alignment marks.

10. The method as described in Claim 1 wherein said substrate is a deformable flexible substrate.

11. The method as described in Claim 1 wherein said substrate is plastic.

12. The method as described in Claim 1 wherein said substrate is metal.

13. The method as described in Claim 1 wherein said substrate is paper.

14. The method as described in Claim 1 wherein said substrate is glass.

15. The method as described in Claim 1 wherein said correction is made by a linear coordinate transform.

16. The method as described in Claim 1 wherein said correction is made by a non-linear spline function.

17. The method as described in Claim 1 wherein said image transformation is performed locally for at least one segment of an electronic module.

18. The method as described in Claim 1 wherein said image transformation is performed globally for an array of segments comprising an electronic module.

19. The method as described in Claim 1 wherein said programmable digital mask system comprises an array of digital micro-mirror devices.

20. A method for patterning a plurality of electronic elements on a deformable substrate comprising:

a) calculating a correction between an existing geometric pattern on said substrate and an expected pattern for said $n^{th}$ layer of said substrate;

b) performing an image transformation on a pattern for an $(n+1)^{th}$ layer of said substrate based on said correction to generate a corrected pattern; and

c) controlling the writing of said corrected pattern onto said $(n+1)^{th}$ layer of said substrate using a programmable digital mask and a radiation source.

21. The method as described in Claim 20 wherein said writing comprises guiding radiation from said radiation source to said programmable digital mask and from said programmable digital mask to said deformable substrate.

22. The method as described in Claim 20 wherein said radiation source comprises a pulsed laser source using inter-pulse intervals.

23. The method as described in Claim 20 wherein said radiation source is infrared light.

24. The method as described in Claim 20 wherein said radiation source is ultraviolet light.

25. The method as described in Claim 20 wherein said radiation source is x-ray.

26. The method as described in Claim 20 wherein said existing geometric pattern comprises a plurality of alignment marks.

27. The method as described in Claim 20 wherein said existing geometric pattern comprises a plurality of electronic component features having a pitch of between 1-10 microns.

28. The method as described in Claim 20 wherein said deformable substrate is plastic.

29. The method as described in Claim 20 wherein said deformable substrate is metal.

30. The method as described in Claim 20 wherein said deformable substrate is paper.

31. The method as described in Claim 20 wherein said deformable substrate is glass.

32. The method as described in Claim 20 wherein said correction is made by a linear coordinate transform.

33. The method as described in Claim 20 wherein said correction is made by a non-linear spline function.

34. The method as described in Claim 20 wherein said programmable digital mask system comprises an array of digital micro-mirror devices.

35. The method as described in Claim 20 wherein said image transformation is performed locally for at least one segment of an electronic module.

36. The method as described in Claim 20 wherein said image transformation is performed globally for an array of segments comprising an electronic module.

37. A computer-controlled method for patterning a substrate comprising:

exposing an image onto said substrate using an optical system and a programmable digital mask loaded with said image;

optically measuring an existing geometric pattern on an $n^{th}$ layer of said substrate;

calculating a correction between said existing geometric pattern and an expected pattern for said $n^{th}$ layer of said substrate using a computing device;

performing an image transformation on an electronic pattern for an $(n+1)^{th}$ layer of said substrate, based on said correction, to generate an electronic corrected pattern stored in said computing device; and

writing said corrected pattern onto said $(n+1)^{th}$ layer of said substrate.

38. The method as described in Claim 37 wherein said radiation source comprises a pulsed laser source having inter-pulse intervals.

39. The method as described in Claim 37 wherein said radiation source is infrared light.

40. The method as described in Claim 37 wherein said radiation source is ultraviolet light.

41. The method as described in Claim 37 wherein said radiation source is x-ray.

42. The method as described in Claim 37 wherein said existing geometric pattern is a representation of said image and comprises a plurality of alignment marks.

43. The method as described in Claim 37 wherein said existing geometric pattern comprises a plurality of electronic component features having a pitch of 1-10 microns.

44. The method as described in Claim 37 wherein said substrate is deformable and is plastic.

45. The method as described in Claim 37 wherein said substrate is deformable and is metal.

46. The method as described in Claim 37 wherein said substrate is deformable and is paper.

47. The method as described in Claim 37 wherein said substrate is deformable and is glass.

48. The method as described in Claim 37 wherein said correction is made via a linear coordinate transform.

49. The method as described in Claim 37 wherein said correction is made via a non-linear spline function.

50. The method as described in Claim 37 wherein said programmable digital mask comprises an array of digital micro-mirror devices.

51. The method as described in Claim 37 wherein said programmable digital mask comprises a liquid crystal light valve array.

52. The method as described in Claim 37 wherein said image transformation is performed locally for at least one segment of an electronic module.

53. The method as described in Claim 37 wherein said image transformation is performed globally for an array of segments comprising an electronic module.

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